

Translation

PATENT COOPERATION TREATY

PCT/DE2003/001925



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

17 DEC 2004

Applicant's or agent's file reference D7300180WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DE2003/001925	International filing date (<i>day/month/year</i>) 10 June 2003 (10.06.2003)	Priority date (<i>day/month/year</i>) 17 June 2002 (17.06.2002)
International Patent Classification (IPC) or national classification and IPC H01L 23/31		
Applicant INFINEON TECHNOLOGIES AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 16 January 2004 (16.01.2004)	Date of completion of this report 22 March 2004 (22.03.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/DE2003/001925

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages _____ 1-8 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the claims:
pages _____ 1-12 _____, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the drawings:
pages _____ 1/3-3/3 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	8	YES
	Claims	1	NO
Inventive step (IS)	Claims	8	YES
	Claims	1	NO
Industrial applicability (IA)	Claims	1, 8	YES
	Claims		NO

2. Citations and explanations

Claim 1 relates to a packaging for semiconductor components; with this wording, the semiconductor component is not part of the claimed subject matter. The following relative clause (wherein ...) clearly refers to the components and not to the packaging; that is, that relative clause describes additional features of the components, which are not part of the claimed subject matter, so the chip, the substrate and the overmold are not part of the claimed subject matter either. The features of the characterizing portion define additional features of the substrate and moulding material. Consequently, the features of the characterizing portion of claim 1 are not part of the claimed subject matter either.

The subject matter of claim 1 is therefore a packaging which is suitable for encapsulated semiconductor components as described in claim 1. The subject matter of claim 1 is not novel, because every box anticipates the subject matter of claim 1, provided that the box is only large enough to accommodate an encapsulated semiconductor component.

Even if the claim is read with an attempt to make technical sense out of it (packaged semiconductor component ..., wherein at least the back and ...), there are still problems with the clarity of the claim, because the feature "so that moulding material can penetrate into the substrate by capillary action" refers to the state prior to

packaging, but the subject matter of the claim is actually the finished, packaged component. In addition, the feature "by capillary action" relates to the method of production, because the capillary action depends not only on the size of the pores but also on the temperature-dependent surface tension of the moulding material. Consequently, it is not apparent from the finished component whether the moulding material has penetrated into the pores due to the exertion of pressure or by capillary action.

A hypothetical claim (packaged semiconductor component ..., wherein at least the back and ... so that moulding material has penetrated into the substrate) is briefly analysed below in respect of novelty and inventive step:

The subject matter of claim 1 is not novel.

The English abstract of the document JP-A-02 178 953 is regarded, in conjunction with the drawing of JP-A-02 178 953, as document D1. Document D1 discloses a packaged component having all the features of claim 1:

The lead-frame (21) with the porous resin film located on top of it and underneath it (see, in particular, figure 2b) is regarded as the substrate of claim 1. The moulding material 25 also encapsulates the back of the chip, because moulding material is located both above and below the unit consisting of chip and substrate.

The term "sponge-like" in the description, page 4, lines 26 to 30 and claim 7 is unclear, because it does not seem possible to achieve a sponge-like structure by mechanical surface treatment; the term "sponge-like" is therefore interpreted, contrary to the actual literal meaning, to include also surfaces having depressions and projections. Packaged semiconductor elements which have all the features of a claim 1 interpreted in this way are disclosed in document US-A-6 107 679 and in document US-A-2001 026 959

(the printed circuit board 33 and solder mask 25 are interpreted as a substrate within the meaning of claim 1).

Document D1, which is considered to be the closest prior art, discloses a method from which the subject matter of claim 8 differs in that the structure consisting of the ready-mounted chip on the substrate is preheated to the melting temperature of the moulding material before the overmold is applied.

The problem addressed by the present invention can therefore be considered that of allowing deep penetration of the moulding material into the substrate by preventing premature solidification of the moulding material.

The solution to this problem as proposed in claim 8 of the present application involves an inventive step (PCT Article 33(3)) for the following reasons:

There is no hint in the prior art that the structure consisting of the ready-mounted chip on the substrate be heated once again.